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ABSTRACT

In Phase 1 of this four-phase cycle, requests for new systems or for evaluation of current systems are reviewed. Those seeming to have the most promise in terms of improved instruction, increased efficiency, and economy will be assigned priorities subject to constraints of material and manpower resources. In Phase 2, a detailed definition of the system to be developed will be prepared for projects approved by the review committee. A senior instructional systems analyst will work closely with an individual or committee from the academic department in which the course is taught to develop this description, which will provide a complete specification of the system. In Phase 3, the proposal and project description will be given to a development team consisting of design and media specialists working with a subject matter specialist to design, produce and implement the instructional system. In Phase 4, during the first semester of actual use, the system will be empirically validated by an evaluation team working with the course instructor. Results of this evaluation will be used to revise or redesign the system subject to approval by the department and the review committee. (MBM)

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INSTRUCTIONAL RESEARCH AND DEVELOPMENT

Organizing for Instructional System Development

M. David Merrill

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Four Phase Development Process

This section describes a four phase cycle for the development of an instructional system. Each phase will be briefly described, and the personnel involved in each phase will be identified. Following the brief introductory paragraphs each phase will be described in greater detail and the documentation produced during each phase will be specified.

Figure 1 illustrates each of the four phases by means of concentric circles. In Phase 1, requests for new systems or for evaluation of current systems are reviewed. These requests may be initiated by departments or solicited by Instructional Research and Development. Those seeming to have the most promise in terms of improved instruction and/or increased instructional efficiency and/or economy will be assigned priorities subject to constraints of material and manpower resources within IR&D. This review will be conducted by an instructional systems review committee as illustrated in Figure 2.

Phase 2. After a project has been approved by the review committee, a detailed definition of the system to be developed will be prepared. (See second ring of circle on left of Figure 2.) A Senior instructional systems analyst will work closely with an individual or committee from the academic department in which the course is taught to develop this description. This description will provide a complete specification of the system to be developed.

Phase 3. Subject to approval by the department and by the review committee, the proposal and project description will be given to a development team consisting of design and media specialists working with a subject matter specialist from the department. This team will design, produce, and implement the instructional system.

Phase 4. During the first semester of actual use, the system will be empirically validated by an evaluation team working with the course instructor(s). Results of this evaluation will be used to revise or redesign the system subject to approval by the department and the review committee.

Phase 1 - Project Review and Selection

Table 1 indicates the membership of each team involved in the development process. The instructional systems review committee is composed of three members: the director of the department of Instructional Research and Development (serves as chairman); the director of the department of Educational Media

Services; and a member of EMAC (Educational Media Advisory Council), who is appointed by the chairman of EMAC.

Proposals may be presented by academic departments or they may be solicited by IR&D. Proposals may request the development of a complete system, evaluation of a current system, or development of a pilot system. The department initiating the proposal will be asked to complete a questionnaire which provides basic data concerning the course, its size, expressed purpose, students, etc. and also requests brief descriptions of proposed changes, reason for developing a system, etc. Based on this information plus discussions with the initiating department, the review committee will assign highest priority to those proposals which seem to have the greatest potential for successful development. Criteria for selection include: a) improved cost/benefit ratio, i. e. teaching more students with less personnel without any loss in effectiveness; b) increased effectiveness, i. e. more of the students reaching criterion in a given time and/or most students reaching a higher level of achievement; c) increased efficiency, i. e. teaching more material in a given period of time without undue increase in student time and effort; d) better utilization of faculty, i. e. providing increased student contact with top level professors. The number of proposals selected is always limited by the personnel and resources available at a given time within IR&D.

Phase 2 - System Definition

The adequate development of an instructional system requires first a complete and accurate description of the existing instruction. Existing instruction is carefully analysed for strengths and weaknesses. Proposed improvements are carefully compared to this analysis. Having thoroughly reviewed the existing system, the new system is specified as completely as possible by a comprehensive specification of instructional objectives, careful analysis of the relationship of these objectives to each other and the terminal goal, and careful specification of sequence and type of instruction thought necessary to attain these objectives.

Table 1 indicates that this systems definition will be performed by a senior instructional analyst working closely with one or more subject matter experts representing the department. Except for new courses, it is expected that at least one of the subject matter experts will have had extensive experience in teaching the course.

When this systems definition is completed, it will be reviewed by the department for accuracy, completeness, and appropriateness. When the department is satisfied that the description is indeed the system they wish to implement, the review committee again studies the proposal for feasibility.

potential, etc. using the criteria suggested in phase 1. When both the department and the review committee are satisfied, the project will be directed to phase 3.

Phase 3 - System Development

The systems definition developed in phase 2 serves as a blueprint for development. The development team is directed by an instructional design specialist, who understands instructional analysis in detail. This person, while having similar skills to the instructional analyst, will not be the same person who assisted in the preparation of the systems definition in phase 2. The team leader is assisted by one (or more) instructional design assistant(s) who are graduate students serving as interns in instructional design. The media specialist or production liaison will be a staff member of one of the production departments [i. e., Educational Media Services (EMS), Motion Picture, Instructional Television (ITV), or Electronic Media Department (EMD)]. The media specialist is assisted by one (or more) production assistants who are graduate students serving as interns in educational media.

The subject matter specialist completes the team. This is the person with primary concern for the course and who has had previous experience both with the course and with the subject matter. This person is frequently the same person who worked with the instructional analyst in defining the system. The instructional analyst will not serve as a regular member of the team but will be available as a consultant as needed.

The development team will prepare pre and posttests, exercises, a student syllabus, learning activities, etc., as required to promote acquisition and to assess accomplishment of the objectives. This development includes establishing an implementation procedure and whatever else is necessary to make the system operational. Whenever possible, various components of the system will be tried with selected students during the development.

Phase 4 - System Evaluation

When the development process has been completed and the instructional system becomes operational, an evaluation team together with the course instructor(s) will conduct a detailed evaluation of its effectiveness. This evaluation will include validation to determine the degree to which the instruction promotes acquisition of intended objectives, comparison with previous instruction to determine relative improvement by the new system and, where appropriate, comparison of two or more alternative strategies within the instruction itself.

The data collection, manipulation, analysis and interpretation will be conducted by an evaluation team working closely with the course instructor(s).

The evaluation team leader will be an evaluation specialist from IR&D and will be assisted by one or more graduate student interns in instructional psychology. (See Fig. 2 and Table 1.)

Documentation

During the various phases of instructional systems development, three documents or sets of materials will be produced: 1) a Technical Report; 2) the System itself; and 3) a User's Manual. The technical report contains information needed in analysing the course, discussions of procedures and techniques built into the course during development, and the validation report. The system includes pre- and posttests, learning activities, and a student syllabus. The user's manual describes procedures required to implement the system so that users not involved in the development process can utilize the system.

The technical report will contain several sections (see Table 2) prepared at each of the four phases of development. This document is directed to a professional audience including instructional psychologists and others involved in instructional development. During phase 1, the questionnaire data and report of the review committee comprise section 1. During phase 2 the instructional system analyst prepares a formal report describing the current instructional system (section 2). The definition of the new system comprises section 3, and includes behavioral objectives, content summary, task hierarchy, individualization flow chart, and specification of special instruction and evaluation considerations. During phase 3, the development team leader prepares a formal report (section 4) describing special techniques built into materials, rationale for procedures used, rationale for media used, and descriptions of experimental variables which may have been designed into alternate procedures included in the system. The evaluation team leader prepares a formal report of the validation study (section 5) including a description of control procedures used, a summary of data acquired, interpretations, conclusions, and recommendations resulting from the study.

The system itself is directed to the students and includes a student syllabus, pretests, posttests and instructional activities. The syllabus should direct the student through the system indicating equipment needed, time requirements, procedures to be followed, pacing requirements, logistic considerations, etc. It should, whenever possible, be self-explanatory. When instructional activities are library or reading assignments, these will be included in the syllabus. Multi-media presentations will be explained sufficiently to enable the student to acquire and react with the appropriate materials. Self tests, checklists, etc., are included in the syllabus. Usually this document will be in a form that can be distributed by the college bookstore. Pre and posttests will be provided in a form that is compatible with the objectives and which allows for appropriate security measures. When appropriate, these instruments may involve participation of an observer (the course instructor or other person). When this is the case, appropriate instructions will be considered part of the tests and may be packaged separately or

as part of the user's manual. Instructional activities encompass a wide variety of materials and will be packaged as appropriate for convenient use. Where complex procedures are involved, a detailed explanation will be prepared in the users manual and instructions to the student will be included in the student syllabus.

The user's manual is directed to the course instructor and contains a description of the course, an explanation of the procedures used, an indication of the objectives, and detailed description of appropriate ways to administer the system. In many cases systems will allow several alternative procedures. These alternatives will be clearly explained to facilitate system utilization. The user's manual may also contain summaries of the validation study as may be useful for the course instructor.

TABLE 1

Instructional Development Teams

Phase 1:

Instructional System Review Committee

(Subcommittee of EMAC, Educational Media Advisory Committee)

1. Chairman: Director of Department of Instructional Research and Development.
2. Director of Educational Media Services
3. Member of EMAC appointed to serve

Phase 2:

Systems Definition

1. Senior instructional analyst
2. Subject matter expert
3. Other subject matter persons as desired by department.

Phase 3:

Systems Development

1. Team leader - Design specialist
2. Design assistant - Instructional psychology intern
3. Production liaison - Media specialist
4. Production assistant - Media intern
5. Department liaison - subject matter specialist

Phase 4:

Evaluation

1. Team leader - evaluation specialist
2. Evaluation assistant
3. Department liaison - course instructor

TABLE 2

Documentation Required for Instructional Systems Development

Technical Report

- | | |
|---------|--|
| Sect. 1 | Project request data
Review committee report |
| Sect. 2 | Description of current instructional system |
| Sect. 3 | Definition of proposed instructional system
Objectives, task analysis, flow chart, specifications |
| Sect. 4 | Instructional and media - Rationale and variables |
| Sect. 5 | Validation and comparison report |

Instructional System

- | | |
|----|--------------------------|
| 1. | Pretest(s) |
| 2. | Posttest(s) |
| 3. | Student syllabus |
| 4. | Instructional activities |

User's Manual

- | | |
|----|------------|
| 1. | Rationale |
| 2. | Objectives |
| 3. | Procedures |
| 4. | Validation |

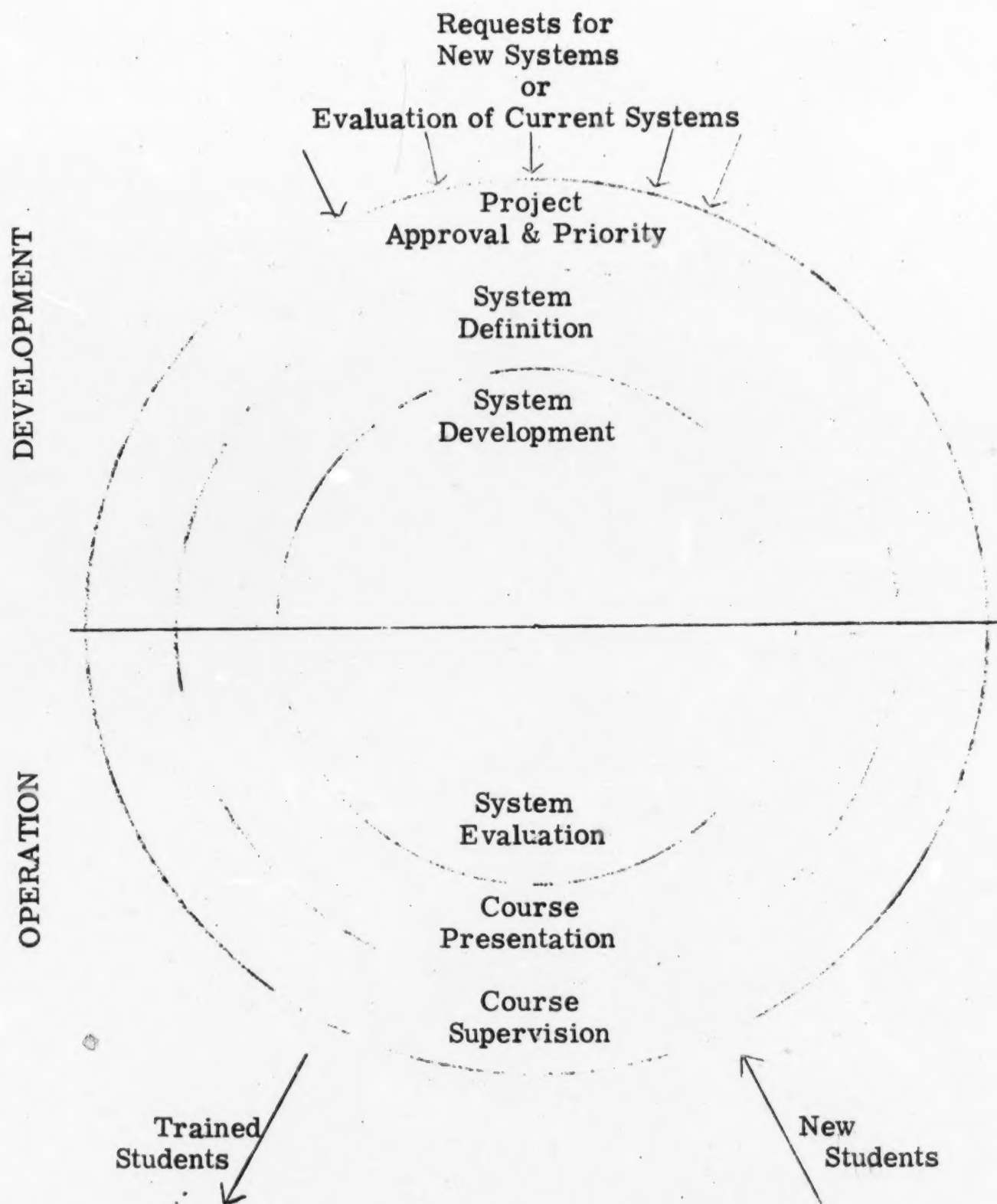


Fig. 11.
Phases of Development Control and Coordination

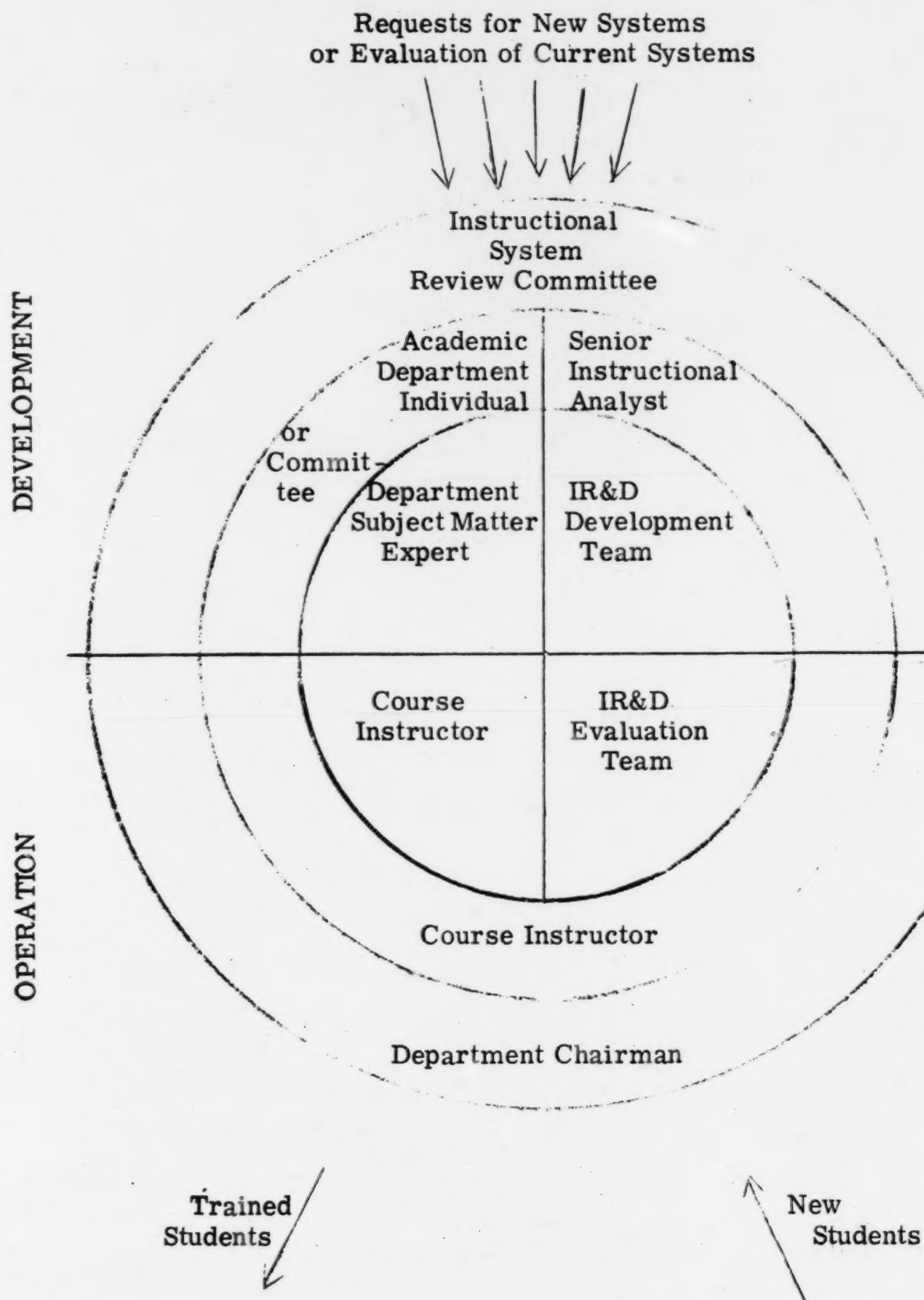


Fig. 2.
Assignments for Systems Control and Coordination